prisms.

--19. (new) The system of claim 14, further comprising a second collimator lens arranged to allow an optical output emitted from the reflective facet to be transmitted through the second collimator lens.

--20. (new) The system of claim 14, wherein a length of the optical fiber is such that a mode-locking oscillation frequency is not more than 1GHz.--

REMARKS

The application is believed to be in condition for allowance at the time of the next Official Action.

The specification has been amended as to form.

A replacement abstract amended as to form is attached.

Claims 1-20 are pending with claims 1, 6 and 14 being independent.

The Official Action rejected originally-filed claims 1-10 under §103 as obvious over BOSCHA 6,418,251.

These obviousness rejections are not believed to be viable as the reference does not teach or suggest all of the recited features of the invention.

As to independent claim 1, there is recited that the cavity has a cavity length defined between a first facet of the semiconductor light-emitting device and a second terminal of the optical fiber. In the reference, the cavity length (designated L

in Figure 1) is defined by a mirror coating on laser diode unit 60 at one end and by another mirror coating M2 at the flat end face 104 of ferrule 94. Reference is made to Figure 4 which clearly shows that there is a distance between the second end of the optical fiber and the second mirror M2. Accordingly, the cavity length is not defined by the distance between a first facet of the semiconductor device and a second terminal of the optical fiber as the length includes the further distance between the second end of the optical fiber and the mirror M2.

Further, the Official Action indicates that it would be obvious to use the reference device where the mode-locking oscillation frequency is not more than 1GHz. Applicant does not believe that the Official Action has made a showing sufficient to justify this ascertation as the Official Action has not considered the length L that would be required using the reference device. If such a length would be impractical, applicant believes that the reference device would not be a suitable assembly for a mode-locking oscillation frequency of not more than 1GHz.

Accordingly, the recitations of claim 1 are not believed to be taught or suggested by the reference and therefore claim 1 is believed to be allowable.

The Official Action indicates that the reference teaches the recited assembly being in a single case having a size smaller than the length of the optical fiber. Applicant does not

believe that Figure 1 makes such a disclosure. See that the optical fiber appears to have a single turn and that the length of the entire assembly is significantly greater than the length of the optical fiber. Therefore, the recitations of claim 2 are not believed to be taught or suggested by the reference.

As to dependent claim 4, reciting the optical system comprising first and second modules connectable to each other through at least one connector, providing the semiconductor light-emitting device is accommodated in a first case and the optical fiber is accommodated in the second case, this claim is also believed to be non-obvious. The Official Action suggests that to construct the recited structure would be a mere duplication of parts. However, this is not the case as a mere duplication of parts would be to duplicate the disclosed system. Rather, in the recitation, certain elements of the systems are put in first modules and certain elements are put in second modules, the two modules being connectable through a connector. That certain modules can be separated and put into individualized modules is more than a mere duplication of parts and is not believed to be part of the prior art for the present subject matter.

Independent claim 6 recites an optical system including a ring-cavity comprising a looped optical fiber having first and second terminals optically coupled to the semiconductor light-emitting device. The reference does not teach or suggest ring-

cavity system. Further, the reference does not teach the recitation of the ring-cavity having a cavity length defined by a length of the looped optical fiber with an optical path length between the first and second terminals of the looped optical fiber. As noted above, the reference has a cavity length greater than the length of the optical fiber itself, there being a distance between each end of the optical fiber and the corresponding reflective mirror.

Accordingly, the recitations of independent claim 6 are not believed to be taught or suggested by the reference.

Claims 7 and 9 are believed to be independently patentable for the reasons stated above.

New claims 11-13 concern the optical system having a cavity length adjustable by an optical path adjuster, where the optical path adjuster may be either one of a pair of wedge prisms and a set of right-angled isosceles triangle prisms. The applied reference does not teach or suggest that the cavity length may be adjustable as recited.

The new claims include new independent claim 14. Claim 14 recites a mode-locking semiconductor laser system comprising a semiconductor laser device with a reflective facet and a polarization-preserving optical fiber with a non-reflective terminal at a fixed end and a reflective terminal at a free end. The claim recites that the optical fiber is optically coupled with the semiconductor laser device and that the cavity is

defined between the reflective facet of the semiconductor laser device and the reflective terminal of the optical fiber. The claim also recites that the free end of the optical fiber is free of connection to any element.

As these features are not taught or suggested by the applied reference, this claim is also believed to be patentable.

Claim 15 recites further elements of the inventive system, these elements also not being taught or suggested by the applied reference.

Dependent claim 16 recites that the optical path length of the independent claim is adjustable. Dependent claims 17 and 18 recite that the optical path length adjuster may be a set of paired wedge prisms or a set of right-angled isosceles triangle prisms.

Dependent claim 19 recites the further system element of a second collimator lens and that the optical fiber has a length such that the mode-locking oscillation frequency is not more than 1GHz.

These recitations also are believed to be patentable.

In view of the above, applicant believes that the present application is in condition for allowance and an early indication of the same is respectfully requested.

Attached hereto is a marked-up version of the changes made to the abstract and specification. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

Respectfully submitted,

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ABSTRACT OF THE DISCLOSURE

An optical system includes a cavity having a semiconductor light-emitting device, and an optical fiber having a first terminal optically coupled to the semiconductor light-emitting device, the cavity having a cavity length defined between a first facet of the semiconductor light-emitting device and second terminal of the optical fiber, wherein a length of the optical fiber is such that a mode-locking oscillation frequency is not more than 1GHz.

VERSION WITH MARKINGS TO SHOW CHANGES MADE

ABSTRACT OF THE DISCLOSURE

The Abstract of the Disclosure has been amended as follows:

An optical system includes a cavity [which comprises] having a semiconductor light-emitting device, and an optical fiber having a first terminal optically coupled to the semiconductor light-emitting device, the cavity having a cavity length defined between a first facet of the semiconductor light-emitting device and second terminal of the optical fiber, wherein a length of the optical fiber is such that a mode-locking oscillation frequency is not more than 1GHz.

IN THE SPECIFICATION:

Page 1, the paragraph beginning on line 17 has been amended as follows:

--Since the recent progress for optical technology enables the emission of the ultra-short optical pulse in femtosecond order, instead of [the] making electrical [measures] measurements with such equipment as sampling [oscilloscope] oscilloscopes, it has been attempted that the ultra-short optical pulse [is] be used as a sampling gate pulse for measuring an ultra high speed phenomenon.--;

Page 1, the paragraph beginning on line 22 and bridging pages 1 and 2 has been amended as follows:

--The ultra-short optical pulse is used as the sampling gate pulse for measuring optical sampling [waveform] waveforms, for example, an optical measurement for eye patterns of the optical waveform. For measuring individual sampling values, it is necessary that respective cross-correlation signal optical pulses are photoelectrically converted without any interference with any adjacent pulse. For this purpose, it is further necessary that a cyclic frequency of the cross-correlation signal optical pulse or a cyclic frequency of the sampling optical pulse is set under a frequency band of an optical receiving system. For this reason, differently from optical communication, a string of optical pulses with a low cyclic frequency of not more than 1GHz is needed.--.

Page 2, the paragraph beginning on line 9 has been amended as follows:

--For improvement in resolving power, the ultra-short optical pulse of a few picoseconds to a few femtoseconds is desirable. The mode locking semiconductor laser utilizing the external cavity is usable for emitting [the] strings of the ultra-short optical pulses of the low cyclic frequency.--.

Page 4, the paragraph beginning on line 15 and bridging pages 4 and 5 has been amended as follows:

--The mode locking semiconductor device having a cyclic

frequency (mode locking oscillation frequency) of not more than 1GHz needs the external cavity with a cavity length of ten centimeters to several [tends] tens of centimeters. The mode locking semiconductor laser system of FIG. 1 utilizes a free space for the optical path, for which reason the cavity length is long. If the cyclic frequency is 1GHz, the cavity length is 15 centimeters. If the cyclic frequency is 250MHz, the cavity length is 60 centimeters. It is difficult that the long optical path is accommodated within a narrow space. It is difficult to reduce the size of the mode locking semiconductor laser system. The large size mode locking semiconductor laser system is disadvantageous in that a slight vibration or a slight strain may cause a relatively large displacement of parts and the mode locking semiconductor laser system is likely to receive influences of the temperature variation and the mechanical vibration. The large size mode locking semiconductor laser system is likely to allow that the oscillation frequency, the cyclic frequency, the polarization state and the optical output intensity vary beyond respective acceptable ranges. It is difficult to obtain a desirable long time and highly stable operation.--.

Page 6, the paragraph beginning on line 3 has been amended as follows:

--It is a still further object of the present invention to provide a novel mode locking semiconductor laser system

including a semiconductor laser device and an external cavity, wherein the mode locking semiconductor laser system is [soupier] superior in stability for a long time in oscillation frequency, cyclic frequency and polarized wave plane against temperature variation and mechanical vibration.--.

Page 29, the paragraph beginning on line 2 has been amended as follows:

--The optical isolator 9 allows oscillation in a clockwise-directional traveling wave locking mode. It is, of course, possible that the optical isolator 9 allows oscillation in [an anti-clockwise-directional] a counter-clockwise-directional traveling wave locking mode. It is also possible that in place of the directional coupler 10, an optical branching filter may also be available for fetching the laser pulses. It is also possible that in place of the directional coupler 10, a translucent mirror is provided on any point on the polarization-preserving optical fiber 6. It is also possible that the isolator 9 is not provided.--.

IN THE CLAIMS:

The following is a list of all the pending claims:

--1. An optical system including a cavity which comprises a semiconductor light-emitting device, and an optical fiber having a first terminal optically coupled to said semiconductor light-emitting device, said cavity having cavity

length defined between a first facet of said semiconductor light-emitting device and a second terminal of said optical fiber,

wherein a length of said optical fiber is such that a mode-locking oscillation frequency is not more than 1GHz.

--2. The optical system as claimed in claim 1, wherein said optical system comprises a single module, provided that said semiconductor light-emitting device and said optical fiber are accommodated in a single case having a size smaller than said length of said optical fiber.

--3. The optical system as claimed in claim 2, wherein said single case further accommodates a temperature controller for controlling a temperature in said single case.

--4. The optical system as claimed in claim 1, wherein said optical system comprises separate first and second modules which are connectable to each other through at least one connector, provided that said semiconductor light-emitting device is accommodated in said first case and said optical fiber is accommodated in said second case having a size smaller than said length of said optical fiber.

--5. The optical system as claimed in claim 4, wherein each of said first and second cases further accommodates a temperature controller for controlling a temperature in each of said first and second cases.

--6. An optical system including a ring-cavity which comprises a semiconductor light-emitting device, and a looped optical fiber having first and second terminals optically coupled to said semiconductor light-emitting device, said ring-cavity having a cavity length defined by a length of said looped optical fiber and an optical path length between said first and second terminals,

wherein a length of said looped optical fiber is such that a mode-locking oscillation frequency is not more than 1GHz.

--7. The optical system as claimed in claim 6, wherein said optical system comprises a single module, provided that said semiconductor light-emitting device and said optical fiber are accommodated in a single case having a size smaller than said length of said looped optical fiber.

--8. The optical system as claimed in claim 7, wherein said single case further accommodates a temperature controller for controlling a temperature in said single case.

--9. The optical system as claimed in claim 6, wherein said optical system comprises separate first and second modules which are connectable to each other through at least one connector, provided that said semiconductor light-emitting device is accommodated in said first case and said looped optical fiber is accommodated in said second case having a size smaller than said length of said looped optical fiber.

--10. The optical system as claimed in claim 9, wherein each of said first and second cases further accommodates a temperature controller for controlling a temperature in each of said first and second cases.

--11. (new) The optical system of claim 1, wherein the said cavity length is adjustable by an optical path length adjuster.

--12. (new) The optical system of claim 11, wherein the optical path length adjuster is a set of paired wedge prisms.

--13. (new) The optical system of claim 11, wherein the optical path length adjuster is a set of right-angled isosceles triangle prisms.

--14. (new) A mode locking semiconductor laser system, comprising:

a semiconductor laser device with a reflective facet; and

a polarization-preserving optical fiber with a non-reflective terminal at a fixed end and a reflective terminal at a free end,

the polarization-preserving optical fiber optically coupled to the semiconductor laser device,

wherein a cavity length is defined between the reflective facet of the semiconductor laser device and the

reflective terminal of the polarization-preserving optical fiber, and

the free end of the optical fiber is free of connection to any element.

--15. (new) The system of claim 14, further comprising:

a first collimator lens;

a wavelength splitter;

an optical path length adjuster; and

a condenser lens,

the semiconductor laser device with a reflective facet, the first collimator lens, the wavelength splitter, the optical path length adjuster, and the condenser lens aligned on an optical axis,

the first collimator lens disposed between the semiconductor laser device and the wavelength splitter,

the wavelength splitter disposed between the first collimator lens and the optical path length adjuster,

the condenser lens disposed between the optical path length adjuster and the non-reflective terminal of the polarization-preserving optical fiber, and

the polarization-preserving optical fiber optically coupled to the semiconductor laser device through the first collimator lens, the wavelength splitter, the optical path length adjuster and the condenser lens.

--16. (new) The system of claim 14, wherein the cavity length is adjustable by an optical path length adjuster.

--17. (new) The system of claim 15, wherein the optical path length adjuster is a set of paired wedge prisms.

--18. (new) The system of claim 15, wherein the optical path length adjuster is a set of right-angled isosceles triangle prisms.

--19. (new) The system of claim 14, further comprising a second collimator lens arranged to allow an optical output emitted from the reflective facet to be transmitted through the second collimator lens.

--20. (new) The system of claim 14, wherein a length of the optical fiber is such that a mode-locking oscillation frequency is not more than 1GHz.--